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A STORAGE AND RETRIEVAL SYSTEM FOR DOCUMENTS IN INSTRUCTIONAL RESOURCES. REPORT NO. 13.

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IN ORDER TO IMPROVE INSTRUCTION WITHIN TWO-YEAR LOWER DIVISION COURSES, A COMPREHENSIVE RESOURCE LIBRARY WAS DEVELOPED AND A SIMPLIFIED CATALOGING AND INFORMATION RETRIEVAL SYSTEM WAS APPLIED TO IT. THE ROYAL MCBEE "KEYDEX" SYSTEM, CONTAINING THREE MAJOR COMPONENTS--A PUNCH MACHINE, FILE CARDS, AND A LIGHT BOX--WAS USED. CARDS WERE HEADED WITH KEY WORDS AND COLOR CODED. SUBJECT HEADINGS AND CATEGORIES WERE DEVISED FOR THREE MAJOR COLLECTIONS, THE RESEARCH LIBRARY, THE CATALOG LIBRARY, AND THE PROGRAM LIBRARY, AND NUMBERS WERE ASSIGNED. BY USE OF THIS SYSTEM, A TEACHER OR STUDENT CAN LOCATE EVERY ITEM IN THE LIBRARY THAT CONTAINS THE SPECIFIC COMBINATION OF VARIABLES HE REQUIRES. LISTS ARE GIVEN FOR CATEGORIES, ITEM NUMBERING, AND FILING. (MF)

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A STORAGE AND RETRIEVAL SYSTEM FOR DOCUMENTS IN INSTRUCTIONAL RESOURCES

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and
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Introduction

The Office for the Study of Instruction was formed at the University of Miami in 1963, under a grant from The Fund for the Advancement of Education. Its function is primarily aimed at the improvement of instruction within the two-year lower-division University College sequence of courses. Since its inception, the Office has attempted to facilitate instructional improvement by four basic methods: (a) evaluation of the on-going programs, (b) development of curriculum, (c) improvement in the use of instruntional technology, and (when needed) (d) improvement of evaluation and testing procedures.

From the beginning it was apparent that a comprehensive resource library containing pertinent information on the use and selection of instructional materials would be required. The present collection of several thousand items is the direct result of a major effort that has been made to obtain all related articles, reports, research studies, and abstracts that were available. As the project progressed, it soon became evident that, rather than a single collection, several types of materials would be required to fulfill the needs of faculty, students in the School of Education, and individuals developing research projects.

Four such collections have developed.

1. The Research Library--research, studies, books and general articles on the use and selection of the various instructional resources.
2. The Catalogue Library--catalogues of resources and equipment available from commercial sources, both foreign and domestic.
3. The Program Library--programmed textbooks and teaching machines for faculty evaluation and student use.

4. Resource Library--the standard AV library containing the instructional materials available at the University. This library, in its several units, now contains a major slide collection of over 60,000 items, 8mm and 16mm films, overhead transparencies, tapes, etc.

As the libraries developed, the need for a simplified information retrieval system became obvious. Faculty and students interested in finding materials related to a specific area of concern found the existing card cataloging system inadequate. Those doing the cataloging found that, for effective utilization, most items required listing under many categories with some requiring fifteen or more independent listings to cover the variables included in the material.

A decision was made to explore and develop a new approach, a cataloging and information retrieval system that would be both simple to implement and easy to use. This report covers the development of this system for the research, programmed materials and catalogue libraries which, while they will be stored as independent units, have been combined for practical cataloging purposes. The cataloging systems for instructional materials, particularly the University's extensive slide collection, are in the process of development and will be covered in later reports.

The Problem

In an effort to provide a learning program of maximum effectiveness, the University has employed various teaching techniques, including television, programmed instruction, seminar use of instructional materials, as well as the various standard projection techniques.

An important facility at the University of Miami is the Learning and Instructional Resources Center. This octagonal building, now

five years old, was the first of its kind specifically designed for television and large group instruction. It houses television studios, offices for production personnel and large auditorium-type classrooms, with a combined capacity of 2,400 students.

In its effort to improve the quality of instruction, the University has made a concerted effort to develop new techniques, procedures and instructional materials, which set purely local requirements for a library of instructional technology. Need indicated that a functional library would have to serve the following purposes:

1. to provide faculty and students directories of resources available on campus.
2. to provide information on films, slides, and other instructional materials available from outside sources.
3. to provide information on the results of experiments and studies conducted in the area of instructional resources and educational improvement.

A system was required that would not only allow easy access to the materials but would allow the researcher to employ discrimination in his selection process. In planning the method of retrieval another key factor was the need for a system that would allow for utilization without the services of a librarian. Students--some of them freshmen--and faculty unfamiliar with the library must be able to find the materials they require without aid and by using specific variables rather than title, broad subject, or author. Simple divisions of subject matter for shelving were also indicated.

In its early stages of development, a system of letters and numbers was used to designate the books and major reports. Cross referencing was a laborious process involving the typing of individual cards containing complete bibliographical information for

each pertinent sub-heading, to allow for research utilization.

During this period, the library had students working on a part-time basis for its staff. As could be anticipated, as more diverse items were obtained, the number of uncatalogued acquisitions soon exceeded the number shelved and thus an ever-growing back-log resulted. It also became necessary to consider some method for speeding up the shelving process.

A computer based system was ruled out by limited funds and the problems of computer accessibility. The method chosen had to be applicable to manual operation and the cataloging system simple enough to be carried out by untrained students and clerical staff since funds for a fully trained librarian were not available. Flexibility was also an important criterion, as the amount of filed material would grow substantially. The present library contains about 3,000 books, documents and periodicals in the fields of instructional technology and audio-visual instruction.

Faced with these requirements, the collection presented unique problems not readily solved by any standard method of shelving, such as the Dewey Decimal or Library of Congress systems. It was necessary to arrive at an original system applicable to this type of collection found, in varying degrees, in more instructional resource or audio-visual centers--a system that would be simple in both filing and use and relatively inexpensive to put into operation.

Components of the System

After considering all these elements and surveying the possible solutions, it was decided to utilize the Royal McBee "Keydex" system, which contains three major components: a simple but highly accurate punch machine, sets of file cards, and a light box.

The cards are used to provide a "peek-a-boo" or light based retrieval system. They are each 10 1/2 x 11 1/2 inches and are printed in small squares much like ordinary graph paper. The cards contain 10,000 of these squares and thus can be utilized in a library with a maximum of 10,000 items. Larger collections necessitate division into smaller components with each item being assigned a number within this range.

The punch mechanism (see Illustration 1) is on a large flat glass plate, bordered with metal numbers. The punch, in the center of the apparatus, is movable, with gauges allowing accurate punching in the desired space. The cards (see Illustration 2) are numbered at the top and at the left side, so that each small square represents a definite number between 1 and 10,000. The cards are placed on the flat glass bed under the drill. One operation of the drill--operated by a foot pedal--can stamp the same number into as many as forty cards for cross-indexing purposes.

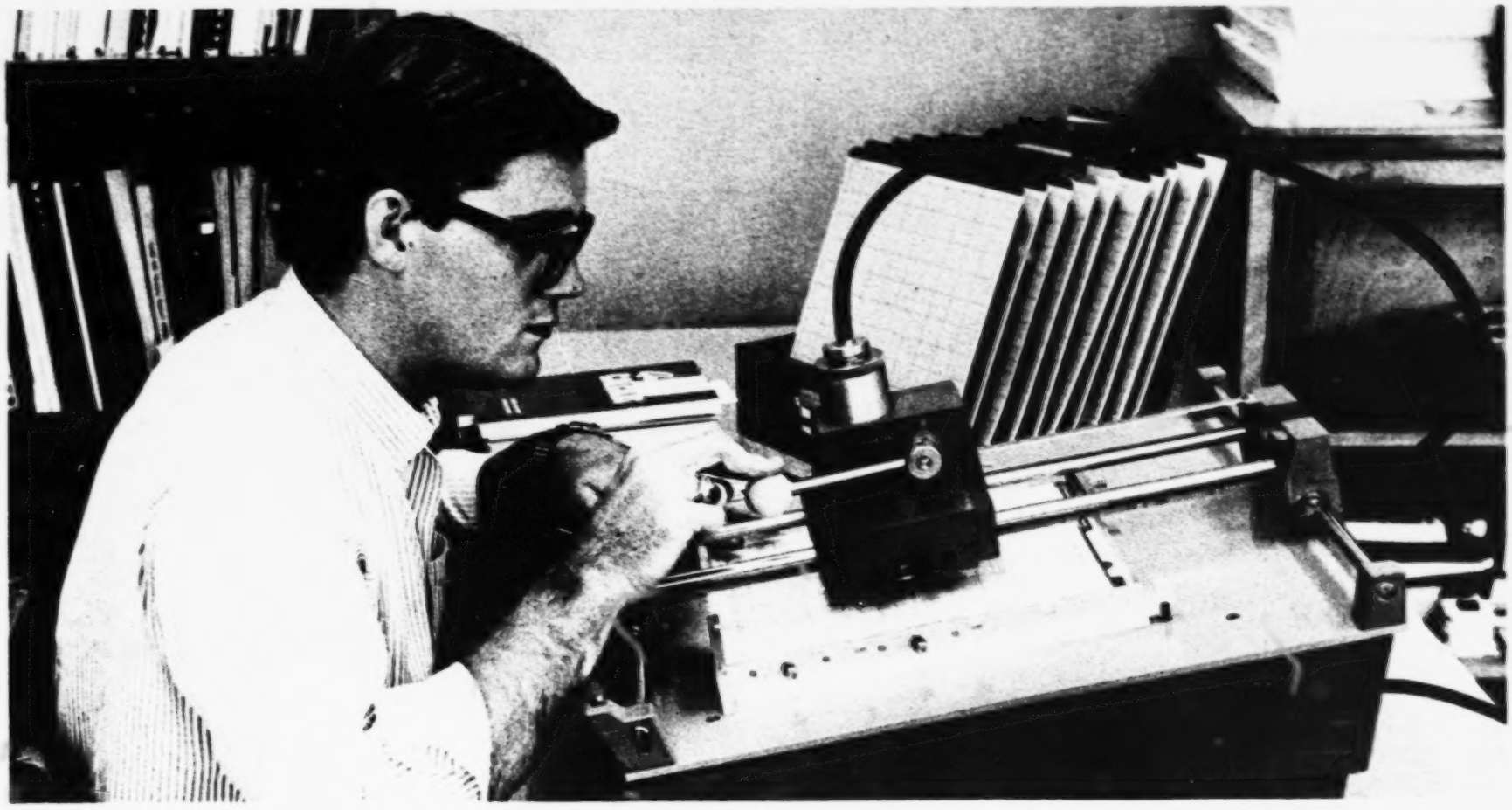

Illustration 1 - The "Keydex" machine provides accurate and simultaneous punching in multiple index cards.

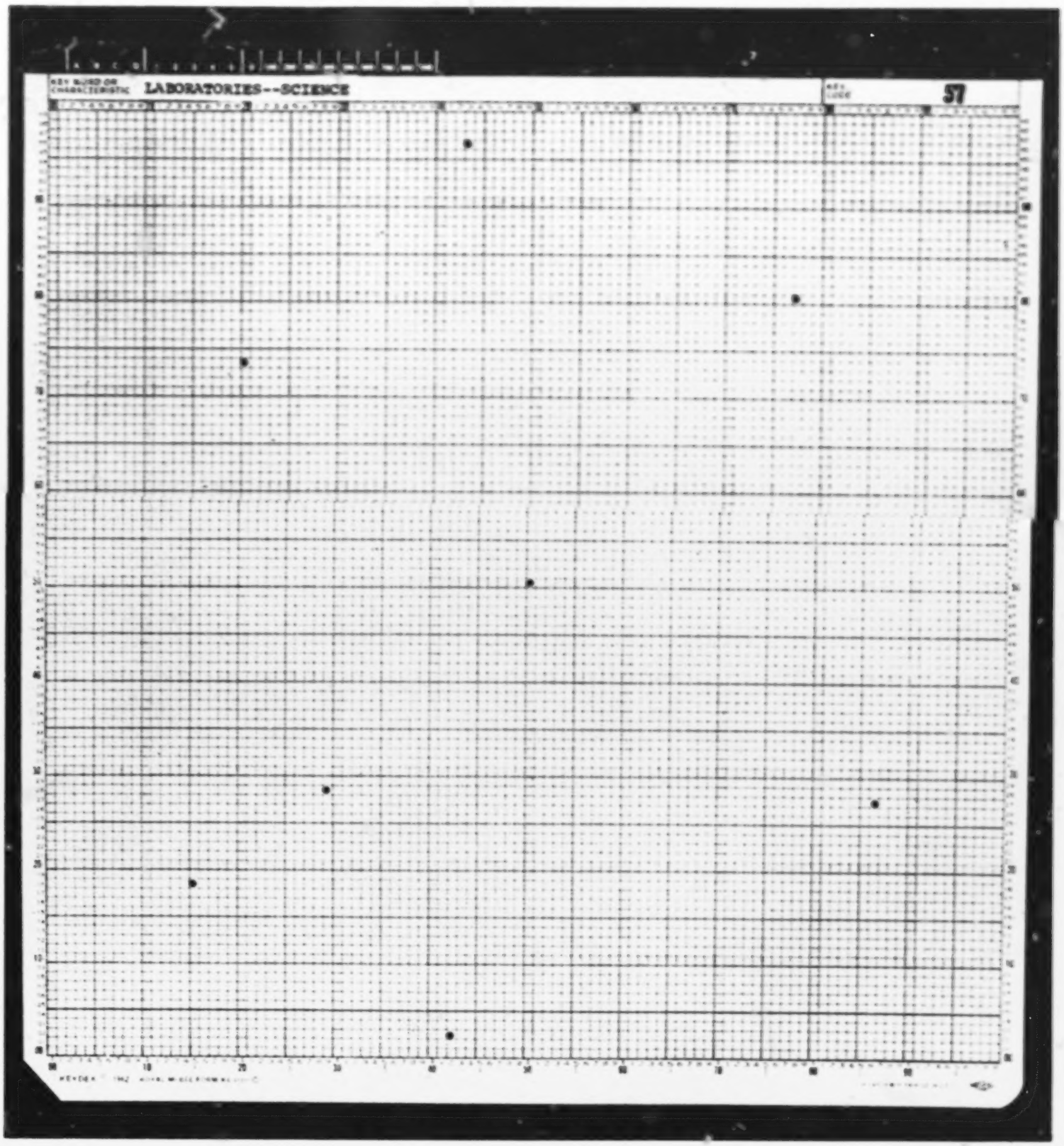

Illustration 2 - A sample index card: holes show location of documents containing reference to the identified subject.

This means that all cross referencing for a single document can be done in one operation, reducing substantially the time required for cross indexing by typing individual cards.

Each card bears a heading in key-word form. For instance, in cataloging a research study concerned with a branching program on punctuation, used at the junior college level, in remedial English, the operator would simply pick out the cards named "research," "program-branching," "English," "remedial," "college--lower level" and, having numbered the book in the program sequence, drill all the cards with that number in the same operation. Thus when a researcher selects his variables and places the cards on the light box, those numbered items with the light showing through contain <u>all</u> his requirements.

The numbering of each item not only supplies the retrieval system but a storage system as well. Since the Instructional Resources library is used for browsing by interested students and faculty members, it was considered necessary to simulate a hierarchial shelving system by assigning certain blocs of numbers--from the total of 10,000--to specifically designated areas. (See page 13) This permits the storage of related items on the same group of shelves.

In assigning numbers, it was also necessary to make some prediction of the direction of future acquisitions, so that enough digits were provided in each grouping to allow for expansion.

There are now in the library, for instance, about 500 programs divided among over twenty subject areas. As could be expected, the number of items in each subject area varies considerably. There are a good many sub-headings in the study of the English language--linguistics, poetry, composition, letter-writing, spelling, use of the dictionary, etc. Comparatively, the number of programs in the art

field is small. With this in mind, decisions were made for assigning numbers in various sections. Out of 2,000 numbers assigned to programs, 500 have been delegated to English. Obviously it can be anticipated that, in time, a second identical library, including all material written or prepared after a certain date, would be established.

The volumes are placed on the shelves in numerical order. Additional copies of any book have the assigned number, followed by "a," "b," or whatever letter would correspond to the number of the copy.

In order to keep an inventory of the library and to find missing volumes if necessary, two cards are typed for each acquisition. One 4 x 6 card, filed in numerical order, contains standard bibliographical information, as well as a list of the cataloguer's cross referencing providing a check list for the punching process and inventory control.

A second card, 3 x 5, is a standard title card containing author and file number. This card serves two purposes. (1) It allows a researcher to locate a specific reference when the title is known, and (2) it prevents duplicate filing. Thus each item is listed on two cards, one by number and one by title. Then its number is punched into as many cross-indexing cards as are required.

Another important aspect of the "Keydex" system is the color-coding of the "decks" of 100 cards each, with the colored bands running in sequences of tens. Each of the cards has a wide band of color at the top right, upon which is a printed number. Numbers from 0 to 9 are on a black band, from 10 to 19 on a brown band, and so on through a series of colors. Hundreds are indicated by punching out the required spaces on the tops of the cards. With a little familiarity it becomes rather simple for the user to flip through the cards to the desired number in a few seconds.

The Cataloging System

To be functional, the "Keydex" system requires a great deal of precision in setting up the categories for cross referencing and retrieval. Unlike other approaches, once a cataloging system is designed, there is no way to expand within the existing number sequence. Because of the color coding, no changes can be made within the number sequence--1-A cannot be inserted between "1" and "2" for instance. Therefore, the selection of the categories to be used is of primary and vital concern.

The test of such a system is in its ease of retrieval. During this phase of development, months have been spent in developing headings and sub-headings, field testing the system, revising, and adding new categories. In the process, over 1,000 reports, studies, and other materials were read and categorized. In the process, new headings were indicated, problems identified, and revisions made.

Early in the development stage, examination was made of "An Information Indexing, Storage, and Retrieval System for Documents in the Field of Instructional Technology," by Boyd M. Bolvin and James D. Finn,[1] but the approach proposed in this paper was not applicable for several reasons. The Bolvin-Finn system was designed for eventual use with the computer, a technique eliminated from consideration by factors of cost and accessibility. This format also necessitates expansion within a numbering sequence, which is not applicable in the "Keydex" materials. And, perhaps most important, the proposed

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[1]Boyd M. Bolvin & James D. Finn, "An Information Indexing, Storage, and Retrieval System for Documents in the Field of Instructional Technology," Instructional Technology and Media Project, School of Education, University of Southern California, Los Angeles, California, June 1964.

break-down in subject headings is not particularly pertinent to the present collection of materials and often appears more complex than would seem suitable to student users.

For these reasons, it became necessary to develop a system based on the needs of this particular library. In determining a numbering sequence for the retrieval cards, much time was taken in examining the cross referencing categories most used in the existing files in the library. It was also imperative to provide as much flexibility for expansion as possible within a somewhat arbitrarily controlled framework. In its final form, the system includes sixteen major subject areas. (See page 12)

In determining categories, frequency of use was an important factor and the terms used had to be those with exact meaning. Since the titles of the retrieval cards have no relationship to the manner in which the documents are stored, some short-cuts could be made.

The word "research," for instance, could apply to "ability levels," "facilities," "education," or almost any other category in the library. To cross file under this heading, it is only necessary to know the format of any report, not the content. The content is punched on another card which, matched to the card named "research" indicates that it is a research report on a specific subject. Additional cards could include grade level, ability level, etc.

The sixteen major areas are broken down into over 430 sub-headings. Since both research and the possible subjects for education are potentially many-faceted, the "subject" category was put last on the list so that it could be added to indefinitely. To allow for some internal growth, empty spaces were left in the numbering system.

The whole approach to this system is visual. For browsers, an attempt has been made to shelve materials in major areas--television,

programs in English, etc., catalogues of available films--together.

In the library, all the subjects of the retrieval cards will be listed alphebetically on large open indexes on upright leaves hanging page-like from a metal standard. Each item is typed on a thin slip of heavy paper and fitted into the required space on the index, making for ease in incorporating additional information at any time.

Once the library user has discovered the placement of the retrieval cards pertinent to his inquiry, he can easily assemble all the pertinent cards.

The indexes are marked not only with the number, but with the color of the band on which the number is filed. If an individual requires all available materials on the relationships of intelligence to student attitudes in the senior high school, he would take card 290 (blue band), card 356 (purple band), and card 24 (red band).

In short, each item in the library is listed on a title card, a number card showing all categories under which it is cross indexed, and its number is punched in any of the over 400 category cards which are pertinent. Thus in a matter of minutes, a researcher can locate every item in the library that contains the specific combination of variables he requires. It is the hope of this office that this system will allow effective and efficient faculty and student utilization.

MAJOR CATEGORIES

I. Ability Levels

II. Applications

III. Catalogues & Prices

IV. Class Size

V. Education Levels

VI. Facilities, Design & Components

VII. Guides (Teacher Manuals, Syllabi, Outlines, etc.)

VIII. Instructional Tools & Techniques

IX. Learning

X. Production Techniques

XI. Research

XII. Student Variables

XIII. Teaching

XIV. Testing

XV. Grant Proposals

XVI. Subject Index

ITEM NUMBERING

Catalogues of Instructional Resources	1 - 999
Programs	1,000 - 2,999
Mathematics	
Engineering	
English	
Science	
Data Processing, Computer	
Business	
Foreign Language	
Social Science	
Industrial Arts	
Home Economics	
Programing	
Other	
Programing	3,000 - 3,999
Television	4,000 - 4,999
Education	5,000 - 5,999
Instructional Resources	6,000 - 6,999
Equipment Catalogues	7,000 - 7,999
Facilities	8,000 - 8,999
Miscellaneous	9,000 - 9,999

FILING LIST
For Information Retrieval System

Ability Levels

Disturbed	00
Gifted	01
Economic Deprived	02
Metally Retarded	03
Multi-racial	04
Physically handicapped	05
Blind	06
Deaf	07
Superior	08

Applications (uses) 10

Catalogues & Prices 11

Class Size

Under 25 students	12
26- 50	13
51-149	14
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Primary	21
Intermediate	22
Junior High	23
Senior High	24
College - Lower Division	25
College - Upper Division	26

Education Levels/Population (con't)

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College - Graduate	28
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